

# Carbon Nanotube Based Electric Propulsion Thruster with Low Power Consumption, Phase I

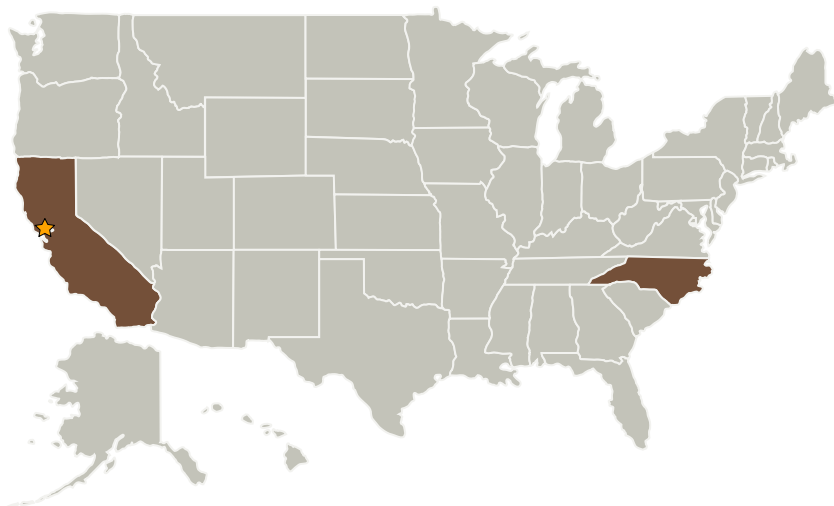
Completed Technology Project (2004 - 2004)



## Project Introduction

This SBIR project is to develop field emission electric propulsion (FEEP) thruster using carbon nanotubes (CNT) integrated anode. FEEP thrusters have gained considerable attention for spacecraft disturbance compensation because of excellent characteristics. The application of current FEEP has been slow in developing mainly caused by high specific power, which limit the milli-Newton thruster development due to insufficient onboard power. Dramatic field improvement from nanometer CNTs is a big advantage to increase the FEEP thrust more than 10 times under constant specific impulse (power). The CNT based FEEP thruster with low specific power and stable long-term operation will meet spacecraft needs with micronewton to millinewton thrust capability. The new FEEP device will be constructed innovative in three aspects: (a) Integration of CNTs into the ion emission anode, (b) Structural combination from the metal tip emitter and the slit emitter, and (c) Selectable operating thrust units. In addition, a solid state thruster based on Cs intercalation with CNTs will also be investigated. The power consumption of the thruster will be reduced by a factor of 5 and more. The CNT ion emission design may also lead to the development of miniature ion source, benefiting ion source based analytical and material processing facilities.

## Primary U.S. Work Locations and Key Partners



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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Ames Research Center (ARC)

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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| Organizations Performing Work | Role                    | Type        | Location                    |
|-------------------------------|-------------------------|-------------|-----------------------------|
| ★ Ames Research Center(ARC)   | Lead Organization       | NASA Center | Moffett Field, California   |
| Xintek, Inc.                  | Supporting Organization | Industry    | Chapel Hill, North Carolina |

## Primary U.S. Work Locations

|            |                |
|------------|----------------|
| California | North Carolina |
|------------|----------------|

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

Changkun Dong

## Technology Areas

**Primary:**

- TX01 Propulsion Systems
  - └ TX01.2 Electric Space Propulsion
    - └ TX01.2.3 Electromagnetic